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#### **RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) CORRECTIVE MEASURES PROPOSAL**

### **GENERAL MOTORS CORPORATION** MARTIN LUTHER KING BOULEVARD 3111-UNI IIU-BILY 2009 14:5 ANDERSON, INDIANA IND 980 700 801

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#### 1.0 INTRODUCTION

#### 1.1 <u>PURPOSE</u>

Conestoga-Rovers & Associates (CRA), EARTH TECH Inc. (Earth Tech), and ENVIRON International Corporation (ENVIRON) have prepared this Resource Conservation and Recovery Act (RCRA) Corrective Measures Proposal (CMP) on behalf of General Motors Corporation (GM) and the Environmental Corporate Remediation (ENCORE), an environmental subsidiary of GM, for the property located at 2915 Dr. Martin Luther King Jr. (MLK) Boulevard, Anderson, Indiana (Site). The term "Site", as used throughout this report, refers to the aggregate of current and former GM properties, including former Plants 6 and 9. The Site's United States Environmental Protection Agency (U.S. EPA) Identification Number is IND 980 700 801. This report is submitted to the Indiana Department of Environmental Management (IDEM) and the U.S. EPA in partial fulfillment of the corrective action requirements contained in Section F.2 of the Administrative Agreed Order Cause H-13855 between Commissioner, IDEM and GM.

GM conducted a RCRA Facility investigation (RFI) to investigate various areas of concern (AOCs), areas of interest (AOIs), solid wave management units (SWMUs) and Areas (aggregate groups of AOCs, SWMUs, etc.) for the presence of releases of hazardous waste or hazardous constituents that could pose a significant risk to human health or the environment. The RFI was conducted in stages between 1997 and 2005, in accordance with various Work Plan documents that were approved by IDEM. Results were submitted to IDEM and the U.S. EPA in 1998, 2001, and 2005. The RFI history is described in further detail in Section 3.9 of the CMP.

Interim Measures have been performed to address on-Site soil and groundwater in the South Court Area, off-Site groundwater at the Meadowbrook Golf Course, and to close former on-Site production wells. The Interim Measures were implemented in accordance with work plans that were submitted to IDEM and are further discussed in Section 3.11. These Interim Measures are being proposed as part of the final Corrective Measures for the Site.

The CMP describes the proposed Corrective Measures for areas of the Site that were determined in the RFI baseline risk assessment to pose a potentially significant risk for reasonable maximum exposures under current and/or future land use. It also provides the rationale for selecting these Corrective Measures.

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IDEM will select final Corrective Measures for the Site after the public comment period. This CMP references more detailed information that can be found in the following RFI documents:

- Soil Gas Data Report (Earth Tech, January 26, 1998)
- Stage I RFI Report (Earth Tech and ENVIRON, July 31, 2001) •
- Final RFI Report (Earth Tech and ENVIRON, August 12, 2005 and revised • September 28, 2007)

There are two separate volatile organic compound (VOC) plumes in groundwater. The AOC1 - South Court plume extends in a northeast direction from the South Court beneath several SWMUs in the Main Plant building. The predominant VOCs detected in this area are TCE, cis-1,2-DCE, and vinyl chloride. The Former Wastewater Treatment Plant (WWTP) Area plume extends from an apparent source near MW 68 along MLK 2009 1 4th 51 Boulevard eastward toward former Plant & The groundwater plumes are discussed further in Section 3.6.

#### REPORT OR CANIZATION 1.2

This CMP is organized as follows:

- Section 2.0 provides a summary of the proposed Corrective Measures.
- Section 3.0 provides a summary of the Site background information, an overview of the RFI, and a description of the Interim Measures conducted during the RFI.
- Section 4.0 provides a summary of the Site risks. •
- Section 5.0 provides a detailed summary of the Corrective Measures options. •
- Section 6.0 provides an evaluation of the proposed Corrective Measures. •
- Figures cited in the text of the Report are found at the end of the text. •

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#### 2.0 PROPOSED CORRECTIVE MEASURE 14:57

The proposed Corrective Measures for the Site include the following elements, including some that have been completed as Interim Measures:

- A groundwater monitoring plan will be implemented to evaluate both the success of proposed in-situ corrective measures for groundwater and the stability of VOC plumes on and off Site by monitoring both interior and boundary areas of these plumes.
- 2) As described below in Section 3.10, Interim Measures were performed to remove soil from the vicinity of MW 31 in the South Court Area, and to treat perched groundwater with HRC<sup>©</sup>. A replacement well MW 32 was installed.
- 3) As described in Section 3.10, two potable wells were abandoned at the Meadowbrook Golf Course and the golf course was subsequently connected to the public water supply.
- 4) As described in Section 3.10, five former on-Site groundwater production wells were plugged and abandoned in accordance with Indiana Department of Natural Resources (IDNR) well abandonment rules (312 IAC 13).
- 5) In-situ bioremediation will be conducted to reduce the VOC mass in the vicinity of the Former WWTP Area.
- 6) The Site will be restricted to industrial/commercial use and the use of groundwater will be restricted through the implementation of a Site-wide deed restriction. The City of Anderson has an ordinance, dated November 21, 2000 (Ordinance #55-2000), that prohibits the installation of new potable water wells for all areas within 300 feet of an existing and available Anderson Water Utility water supply line. The ordinance also prohibits the installation of any new well and the redrilling of any existing well in the shallow aquifer above the regional till.

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#### 3.0 SITE BACKGROUND

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#### 3.1 <u>SITE DESCRIPTION</u>

The Site is located in the northwest quarter of Section 23, T19N, R7E, on the southwest side of Anderson, Madison County, Indiana (Figure 3.1). Formerly, the site comprised approximately 3,000,000 square feet of manufacturing area situated on 234 acres. MLK Boulevard divides the site in a north-south direction. GM previously conducted manufacturing operations in plants on both sides of MLK Boulevard. The former east manufacturing areas (Plants 6 and 9) are bounded by MLK Boulevard on the west, by a railroad on the south, by 29<sup>th</sup> Street on the north, and by Madison Avenue on the east (Figure 3.2).

The manufacturing facilities west of MLK Boulevard, referred to as the Main Plant, are bounded on the west, south and southeast by railroad tracks, and on the north by 25<sup>th</sup> Street. Parking areas are located west of the westernmost railroad, and north of 25<sup>th</sup> Street. Developed areas of the property are targely covered with asphalt or concrete. Small areas near former administrative buildings and along property borders are maintained in short grass cover. Land use surrounding the site varies from residential and commercial on the north and east, to residential and recreational on the south, and to agricultural on the west. A small public access park is located in the northwest part of the property. The Meadowbrook Golf Course is located southeast of the site (Figure 3.2).

Operations at the Site began in 1929. Manufacturing plants were expanded several times, generally proceeding from the north end of the Main Plant southward and eastward. East of MLK Boulevard, Plant 9 construction commenced in 1969, and building additions were performed in 1973, 1977, 1981, 1985, 1986, and 1989. There are now no manufacturing operations conducted in the Main Plant. The Main Plant buildings are currently undergoing demolition.

GM has divested itself of portions of the property. The former Plant 6 and 9 properties and a lot east of Madison Avenue have been sold. Except for the former wastewater treatment plant (WWTP) and the parking lot along MLK Boulevard, all property east of MLK has been sold. Figure 3.2 shows the current GM property boundary.

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#### 3.2 <u>CLIMATE</u> Aug

The climate in the area of the Site is classified as temperate (Lapham, 1981). During the period from 1961 to 1990, the normal annual average temperature was 50.9°F at the Anderson sewage treatment plant, with a normal annual minimum of 41.6°F and a normal annual maximum of 60.2°F (Owen and Ezell, 1992). During this 30-year period, normal monthly average temperatures ranged from a low of 24.8°F in January to a high of 73.5°F in July. Normal annual average precipitation during this 30-year period was 38.5 inches with a median of 38.4 inches. Normal monthly average precipitation ranged from a low of 2.0 inches in January to a high of 4.1 inches in July.

#### 3.3 <u>TOPOGRAPHY AND SURFACE WATER DRAINAGE</u>

The area of the Site is nearly level with elevations ranging from 860 to 880 feet above mean sea level (MSL). East of MLK Boulevard the elevation is lowest, and the surface elevation descends into a relict meltwater valley. Former Plant 9, Plant 6, and the Meadowbrook Golf Course are all located in the relict meltwater valley, the western border of which roughly follows the alignment of MLK Boulevard (Figure 3.2). This valley trends south-southwest from Anderson several miles towards Pendleton, Indiana (Brown and others, 2003). A small characterized stream, Stanley Ditch, occupies the north end of the relict meltwater valley and drains westward along the south boundary of the Meadowbrook Golf Course. Stanley Ditch originally flowed to the north between former Plant 6 and Plant 9 but was diverted southward in 1963 to provide stormwater relief for the City of Anderson combined sewer system. As a result, Stanley Ditch is now tributary to Prairie Creek and flows to the south down the trend of the valley to Pendleton, Indiana where it joins Fall Creek, a tributary to the West Fork White River.

Surface water run-off from paved areas of the property is directed to the combined sewer system that discharges north to the City of Anderson POTW on the West Fork White River. Water discharged to the combined sewer system flows northward across the Meadowbrook Golf Course property and beneath former Plant 9 up the trend of the relict meltwater channel. Surface water on the northern portion of the Meadowbrook Golf course property is directed through piping, and discharges to ponds on the golf course property. Surface water in the southern portion of the Meadowbrook property drains southward toward Stanley Ditch that flows along the southern and eastern property boundaries of the golf course.

A drainage divide between Stanley Ditch and Prairie Creek, draining to the south, and the combined sewer system, draining north to West Fork White River, appears to occur

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near the south side of former Plant 9, pernaps near and along the South Anderson Cutoff railroad embankment. Areas to the south of the railroad embankment, including most of the Meadowbrook golf Course are floodway and floodway fringe areas subject to flooding (FEMA, February 18, 1994).

#### 3.4 <u>REGIONAL SETTING</u>

The Site is situated in the New Castle Till Plains and Drainageways Section of the Central Till Plain Region as described by Gray (2000). This area was affected by multiple continental glaciations that deposited a thick blanket of glacial sediments over the bedrock. The New Castle Till Plains and Drainageways Section is primarily underlain by complexly stratified glacial diamict deposits glaciofluvial sand and gravel deposits and glaciolacustrial silt and clay deposits. The area is characterized by broad plains of low relief crossed by relict glacial meltivater valleys.

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# 3.4.1 <u>REGIONAL SOILS dentitier</u>

The general area of the Site contains six Orited States Department of Agriculture, Natural Resources Conservation Service soil series mapping units (Schermerhorn, 1967). Soils west of MLK Boulevard are the Miami silt loam (2 to 6 percent slopes, Crosby silt loam (0 to 2 percent slopes), Brookston silty clay loam, Celina silt loam (0 to 2 percent slopes) and Fox silt loam (0 to 2 percent and 2 to 6 percent slopes). These soils all develop in glacial drift deposits of Wisconsinan age. The Kokomo mucky silt loam is present east of MLK Boulevard. These soils occur at former Plant 9 within the relic meltwater valley.

The Miami silt loam is a deep, well-drained, and moderately eroded soil found along drainage ways, low knolls, and divides. The estimated permeability of the Miami silt loam is 0.8 to 2.5 inches/hour to a depth of 10 inches below ground surface (bgs) and 0.2 to 0.8 inch/hour from 10 to 36 inches bgs. The Crosby silt loam, which occurs on nearly level slopes, is a deep, somewhat poorly drained soil. The estimated permeability from the surface to 10 inches bgs and from 34 to 42 inches bgs ranges from 0.8 to 2.5 inches/hour. From 10 to 34 inches bgs, the estimated permeability ranges from 0.2 to 0.8 inch/hour. The Brookston silty clay loam is a deep, very poorly drained soil found in upland depressions. The estimated permeability from the surface to 59 inches bgs is 0.2 to 0.8 inches/hour. Celina silt loam, which occurs on uplands, is a deep, moderately well drained soil. Estimated permeability of the Celina silt loam from ground surface to 9 inches bgs is 0.2 to 2.5 inches/hour and from 9 to 42 inches bgs is 0.2 to

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0.8 inches/hour. The Fox silt loan is deep, well drained soil found along low ridges or divides between uplands or terraces. The estimated permeability from ground surface to 30 inches bgs is 0.8 to 2.5 inches/hour, from 30 to 36 inches bgs is 5 to 10 inches/hour and from 36 to 40 inches bgs is 0.2 to 0.8 inches/hour.

The Kokomo mucky silt loam, which occurs in low swales of the uplands, is a deep, very poorly drained soil with high organic matter content. The estimated permeability of the Kokomo mucky silt loam ranges from 0.2 to 0.8 inches/hour to a depth of 21 inches bgs, 0.05 to 0.8 inches/hour to a depth of 49 inches bgs and 0.8 to 2.5 inches/hour from 49 to 56 inches bgs.

#### 3.4.2 <u>REGIONAL GEOLOGIC SETTING</u>

Madison County and the Anderson area are undertain by glacial drift deposits of varying thickness overlying an irregular bedrock surface developed on carbonate rocks of Silurian age assigned to the Wabash and Fieasant Mills Formations (Gray and others, 1987). The surficial drift deposits are related to the latest (Wisconsinan) glacial stage. Buried pre-Wisconsin deposits are common in the area and occur below a well-developed Sangamon paleosol (a buried soil) and weathering zone.

The Wisconsinan glacial deposits are related to the latest advances of the East White Sublobe of the Huron-Erie ice lobe. These ice sheets advanced eastward and southeastward into central Indiana from the Erie basin during the Woodfordian Substage. The deposits are dated to approximately 20,000 years before present (ybp). Regionally, the latest phases of the East White Sublobe advanced rapidly but stagnated in central Indiana forming a complex array of meltout ablation drift types overlying hard, basal or lodgement tills of loamy texture. The Wisconsin till deposits are generally mapped in Indiana as the Trafalgar Formation (Gray, 1989). The Trafalgar Formation consists of poorly sorted, conglomeratic mudstone (diamict) and associated lenses of gravel, sand, and silt. Concurrent with the massive stagnation and meltout, a system of meltwater channels developed the carried large meltwater streams southward from the stagnated ice front. Many of these relict meltwater channels are preserved in the Madison County landscape today as low, wide topographic troughs occupied by small, underfit surface streams.

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#### 3.5 <u>SITE HYDROGEOLOGY</u>, 2009 14:57

Figure 3.3 presents a generalized, schematic hydrogeologic cross section of the unconsolidated materials at the site showing monitoring well completion intervals. The unconsolidated deposits range from less than 20 to over 160 feet in thickness and overlie an irregular bedrock surface. Bedrock beneath the Site consists of carbonate rocks of Silurian age. The bedrock topography beneath the site slopes to the northwest into a pre-glacial bedrock valley. The bedrock is high (above 840 foot elevation) in the southern portion of the former Plant 9 area and at the Meadowbrook Golf Course. Bedrock is generally only about 20 feet deep in this area as a result of both the high bedrock elevation and low ground surface elevation in the relict meltwater channel area east of MLK Boulevard. To the northwest, the bedrock elevation descends to below 730 foot elevation at former groundwater production well 11, and the bedrock in this area is in excess of 158 feet depth.

Detailed hydrogeologic cross sections are presented in both the Stage II RFI Data Report (Earth Tech, March 30, 2005) and the RFL final Report (Farth Tech and ENVIRON, September 28, 2007). Five distinct geologic units are recognized in the unconsolidated surficial soil materials. These units are identified from top to bottom as Units 1 to 5.

Unit 1 is a heterogeneous fill material consisting of silty clay loam, silty clay, sandy clay, sandy clay loam, and loam texture soil intermixed, in places, with debris consisting of wood, brick, glass, brick, concrete, coal fragments, and cinders. The unit consists of fill material placed at various times during the developmental history of the property and is generally no more than a few feet in thickness.

In places, the lower portion of the Unit 1 fill is saturated and a localized perched groundwater zone occurs. The clayey diamicts in Unit 2 form an underlying confining unit resulting in this perched groundwater condition. Saturated conditions have been observed in the basal portion of Unit 1 in several shallow AOC 1 – South Court Area soil borings.

Unit 2 is a glacial diamict of silty clay loam, silty clay, and loam texture with occasional thin, interbedded sand and gravel deposits. Sand and gravel lithologies make up a small percentage of the unit. Unit 2 is thin in southern and eastern parts of the Site, but thickens to the north and west.

Unit 3 consists of stratified sand and gravel and forms the uppermost aquifer beneath the Site. In places, a diamict occurs within Unit 3 and is identified as the Unit 3 Confining Bed. At some locations the confining bed is represented by a distinctive silty

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texture and laminated structure. The contining bed is hydrologically significant because it separates the Unit 3 aquifer into an upper portion (Unit 3S) and lower portion (Unit 3D). Unit 3 is generally only 10 to 20 feet thick in the eastern part of the Site beneath the meltwater valley. The unit thickens appreciably in the western part of the area where it forms the major portion of the unconsolidated deposits.

Unit 3 is almost entirely within the phreatic zone and is the uppermost aquifer unit at the Site. Groundwater may exist in the unit under both confined and unconfined conditions. Where the base of Unit 2 is relatively high in elevation, the upper few feet of Unit 3 are unsaturated, and unconfined conditions occur. At locations where the base of Unit 2 is relatively low in elevation the top of Unit 3 is saturated, and confined conditions occur.

Conceptually, Unit 3 may be divided into upper (Unit 3S) and lower (Unit 3D) parts. In those places where there is no physical separation between the upper and lower parts of the unit provided by the Unit 3 Confining Bed The designations 3S and 3D merely provide a convenient way to refer to the upper and lower portions of the Unit 3 aquifer, and the monitoring wells completed therein. Where a physical separation occurs due to the presence of the Unit 3 Confining Bed, Unit 35 refers to that portion of the aquifer above the confining layer and Unit 3D refers to that portion below the confining layer. Locally, the Unit 3 Confining Bed incluces a downward vertical gradient within the Unit 3 aquifer. Where the confining bed is absent, water levels in Units 3S and 3D are comparable.

The lateral groundwater gradient in Unit 3S is directed to the northeast in AOC 1 - South Court Area. Locally there are significant variations in the magnitude and direction of the gradient related, in part, to the presence or absence of the Unit 3 Confining Bed. An east-southeast oriented potentiometric trough in Unit 3S persistently occurs in the vicinity MW 40, 42, and 68 where the confining bed is absent. In this area groundwater flow in Unit 3S appears to drain easterly into the relict meltwater valley.

The hydraulic gradient for Unit 3D is more consistent and the potentiometric surface for this unit suggests an eastward gradient in the South Court Area and along MLK Boulevard. The north-northeast / south-southwest oriented relict meltwater valley at former Plant 9 and the Meadowbrook Golf Course appears to induce a hydraulic gradient to the south along its axis. Contaminants in the lower portion of Unit 3 would be expected to move generally eastward and then southward near the former WWTP area.

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Unit 4 consists of hard diamict of roam or clay loam texture. The unit forms a confining bed between Unit 3 and Silurian carbonate bedrock. The unit is absent from the eastern part of the area at Plant 9 and portions of the adjacent Meadowbrook Golf Course.

Two deep bedrock borings at the north end of the site (MW 62 and MW 71) encountered a bed of cobbles above the bedrock surface. This zone is referred to as Unit 5. The unit was encountered at no other locations.

#### 3.6 <u>VOC PLUME AREAS</u>

Isoconcentration maps for Unit 3 (Earth Tech and ENVIRON, September 28, 2007, January 31, 2007, and January 31, 2008) indicate that there are two separate VOC plumes. One plume is associated with AOC 1 – South Court. The AOC 1 – South Court plume extends in a northeast direction from the South Court beneath several SWMUs in the Main Plant building. The predominant VOCs detected in this area are TCE, cis-1,2-DCE, and vinyl chloride. The highest reported concentrations of TCE in this plume are found in the South Court at MW 3 and MW 15 (Unit 3S) and MW 31R (Unit 1). Perched groundwater in Unit 1 appears to serve as a source of VOCs in Unit 3. These VOCs are present in both the 3S and 3D portions of Unit 3, but concentrations are generally higher in the upper portion of the unit.

A separate VOC plume is located along and east of MLK Boulevard. This plume appears to be associated with the Site wastewater treatment plant (WWTP) formerly located in this area. The Former WWTP Area plume appears to be separate from the AOC 1 South Court plume. The primary evidence for separation of the plumes comes from four Unit 3S wells located between the plumes where VOCs have not been detected (**Error! Reference source not found.**, MW 16, 17, 57 and 84). The former WWTP area plume extends from an apparent source near MW 68 along MLK Boulevard eastward toward former Plant 9.

#### 3.7 WATER SUPPLY AND GROUNDWATER USE

#### 3.7.1 <u>RESIDENTIAL WELL SURVEY</u>

A residential well survey was conducted in December 2000 to identify groundwater wells in use around the Site. Figure 3.4 shows the location of the survey area and identified wells. The survey concentrated on downgradient areas to the east of the Site, and now known to encompass the entire area of the VOC plume associated with the Site. In this survey, GM compared all building addresses within the potentially affected area

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to city water service records to locate any structure that was not serviced by city water. Owners of the property at these addresses were contacted and ten potable wells were identified and sampled. These included several wells along MLK Boulevard southeast and south of the Site and two wells on the Meadowbrook Golf Course. In addition, one well was identified at a business on the north side of 29<sup>th</sup> Street. Although this well was outside the designated survey area, it was included in the survey.

Based on the neighborhood survey and analytical results, GM is confident that none of the ten potable wells have been or will be impacted. Each well was sampled for VOCs in December 2000, and results were included in the Stage I RFI Report. No VOCs were detected in any of the wells.

The City of Anderson's public water supply is provided by the Anderson Water Utility and is derived entirely from groundwater. The City obtains groundwater from Raney collector wells located adjacent to the White River.

The City of Anderson has an ordinance, dated November 21, 2000 (Ordinance #55-2000), that prohibits the installation of new potable water wells for all areas within 300 feet of an existing and available Anderson Water Utilit, water supply line. The ordinance also prohibits the installation of any new well and the redrilling of any existing well in the shallow aquifer above the regional till.

#### 3.7.2 FORMER GM PRODUCTION WELLS

Prior to about 1989 or 1990, five high capacity groundwater pumping wells operated on the Site. Three of these wells (WH-9, WH-10, and an undesignated well apparently installed in 1957) were located in the AOI 1 – North Parking Lot Area. The other two wells (WH-11 and WH-12) were located in the West Parking Lot west of the Main Plant building (Figure 3.4). These wells were used for industrial process water and cooling.

According to the Indiana Department of Natural Resources significant groundwater withdrawal registration, the WH-11 well is 103 feet deep and was equipped with a 1,200 gallon-per-minute (gpm) pump. The WH-12 well was listed as 112 feet deep, and was also equipped with a 1,200-gpm pump. Annual groundwater production reports filed by the Facility pursuant to the groundwater withdrawal registration indicate the following total annual withdrawals in millions of gallons for these two pumping wells. The older wells WH-9 and WH-10 are reported to have not been used after 1985.

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Production	Aug ( <u>79</u> 3509 14:57	1986	1987					
Well	(MGY)	(MGY)	(MGY)					
WH-11	299.7	315.2	143.1					
WH-12	314.4	323.5	109.9					
Total	614.1	638.7	253.0					
Note:								
MGY = million gallons per year								

The 1985 and 1986 annual withdrawals equate to a continuous, sustained pumping rate in excess of 1,200 gpm. Pumping rates of this magnitude would be expected to have a large impact on both groundwater flow direction and rate at the Site. All wells were unused after 1987.

#### 3.8 LAND USE

FONA Figure 3.5 illustrates the current City of Anderson zoning designations for the Site and surrounding areas. The Site is in an area zoned predominantly as industrial I-2. This designation incorporates existing industrial developments and provides adequate room for new industrial development. Realizing the need for industrial expansion, the I-2 District does not permit aveilings or small Distinesses. This area has been zoned for industrial use since before 1962 as indicated by the 1962 master plan (City of Anderson, 1962).

Areas adjacent to the Site are zoned R-2, R-3, R-4, I-1 and I-2. The R designations include single family dwellings, single and two family dwellings and multifamily dwellings The I-1 designation incorporates many of the existing industrial respectively. developments along MLK Boulevard and provides for industrial expansion. Permitted uses include only those where all of the operations, including storage of materials are confined within a building and the performance characteristics are compatible with uses permitted in neighboring districts. Residences and business are permitted in these areas.

The I-2 industrial zoning is also applied to the area south of former Plant 9. This area contains a mobile home park and the Meadowbrook Golf Course. The mobile home park and golf course were grandfathered into the zoning plan when this are was designated as industrial I-2. Only industrial development consistent with the current and proposed zoning classifications (i.e., no new residential development) will be permitted in the future at these locations (Carroll, 1997).

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The area between the South Anderson cutoff railroad embankment and 38<sup>th</sup> Street to the south, including the Meadowbrook Golf Course and the trailer park also has an "F" overlay zoning designation. This area is FEMA designated floodway and floodway fringe (see Section 3.3).

#### 3.9 <u>ECOLOGY</u>

An ecological screening risk evaluation (SRE) performed as part of the Stage I RFI is discussed in Section 4.3.3 of the Stage I RFI Report. The objective of the SRE was to identify the potential for ecological risks associated with releases at the Site. The ecological SRE evaluated the ecological setting around the Site and the presence of ecological receptors and complete exposure pathways in conjunction with the available site characterization data to determine the necessity for additional investigation of potential ecological risks. The ecological SRE is based on a review of available information from several sources including the U.S. Geological Survey, National Wetland Inventory (NWI) map, and the Indiana Department of Natural Resources.

Based on the SRE findings, the closest potential ecological receptor to the Site appeared to be the drainage corridor of White River. Although three areas of apparent palustrine emergent wetland vegetation were identified in the Site area, these areas are not believed to be of significant ecological value due to the level of anthropogenic disturbance in the vicinity. No endangered or threatened species or significant natural areas are located within two miles of the Site according to the Indiana Department of Natural Resources. Future use of the Site is not expected to change these conclusions since no change to the basic ecological setting (and absence of ecological receptors) is expected.

The potential for Site-related constituents to reach the White River was evaluated as part of the Stage II RFI investigations designed to further characterize the nature and extent of the groundwater contaminant plume. Based on the Stage II RFI findings, the kidney shape pond located on the golf course was determined to be a potential groundwater receptor. In order to evaluate the potential human and ecological exposure to surface water, surface water data were compared to both human and aquatic based screening criteria as described in Section 4.0 of the Final RFI Report. Any exceedance to human or aquatic screening criteria was further evaluated in Section 5.0 of the Final RFI Report.

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#### 3.10 <u>RFI OVERVIEW</u> Aug 07, 2009 14:57

GM submitted notification to the U.S. EPA as a large quantity hazardous waste generator on August 18, 1980, qualifying the Facility for interim status for containerized storage of hazardous wastes. The Facility initially submitted separate RCRA Part A permit applications, and received separate identification numbers, for the Main Plant (west of MLK Boulevard) and Plants 6 and 9 (east of MLK Boulevard). Effective December 1982, at the Facility's request, one identification number was canceled, and the entire Site began operating under one identification number (IND 980 700 801).

A RCRA Part B permit application was initially submitted in 1983, and a revised Part B application was submitted January 15, 1992. The Federal Part B permit became effective February 14, 1993 and contained corrective action requirements for several areas. These corrective action requirements largely followed the corrective action recommendations contained in the RFA. The RCRA Part B permit was renewed as necessary by GM through 2003.

GM contested certain RCRA permit conditions in a petition for review filed on February 5, 1993. Submittai of an RFI Work Flan for specific SWMUs targeted for corrective action was stayed during the review period. As noted and stipulated in correspondence from U.S. EPA Region 5 dated September 6, 1994, the Environmental Appeals Board rendered a decision on the petition July 11, 1994, and submittal of an RFI Work Plan for investigations at several SWMUs became due by February 8, 1995.

A final RFI Work Plan for conducting investigations at several areas was submitted on October 14, 1997. This Work Plan was approved by the U.S. EPA and the IDEM on November 20, 1997.

Preliminary RFI investigations were initiated in December 1997 with a soil gas survey of the general AOC 1, SWMU 17 and the West Chromium Areas, using a direct-push probe-type sampling system and on-site gas chromatographic (GC) analysis. The results of these investigations were provided in the RFI Soil Gas Data Report (Earth Tech January 26, 1998). This report was submitted to the IDEM in January 1998. The report contained a plan for soil boring and sampling based on the soil gas data. The soil boring plan was conditionally approved by the IDEM on September 1, 2000. GM clarified remaining sampling and analysis issues with the IDEM in a memo dated October 13, 2000 and provided notification that RFI field work was scheduled to begin. Stage I field investigations were initiated by GM in October 2000.

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The Stage I RFI investigations were conducted pursuant to the following Work Plan documents:

- RFI Work Plan (Earth Tech, October 14, 1997);
- Soil Gas Data Report (Earth Tech, January 26, 1998);
- GM notification memorandum (October 13, 2000);
- RFI Work Plan Amendment Walking Track Area (Earth Tech, October 14, 1997); and
- RFI Work Plan Amendment West Impoundment Area (AOC 5) (Earth Tech, October 1, 1998.

GM conducted a residential well survey of areas adjacent to the Site in December 2000. Ten private wells were identified and sampled.

A Stage I RFI report was submitted to the DEM in July 2001 (Earth Tech and ENVIRON, July 31, 2001). The Stage I report addressed investigations conducted from October 2000 through July 2001, including the residential well survey, and was submitted to the IDEM in partial fulfillment of the corrective action requirements contained in Section III.F. of the Federal portion of the RCRA Part B permit. Stage I investigations were conducted at the following investigative areas as currently defined:

- AOC 2 Former Fire Training Area;
- AOC 3 East Chromium Area;
- AOC 4 Walking Track Area;
- AOC 5 West Impoundment Area;
- Area 1 South Court and Related Areas (including AOC 1, SWMU 16, SWMU 17, and West Chromium Area);
- Area 3 East Storage Areas (SWMUs 21 and 22); and
- Area 4 Nalco Areas (SWMUs 25 and 26).

Areas evaluated during the Stage I RFI that required no additional investigation included AOC 2, AOC 4, AOC 5, and Area 4. The Stage I RFI report included a plan for further investigations at AOC 3, portions of Area 1, and Area 3. These additional investigations were conducted during the Stage II RFI beginning in October 2003.

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Stage II investigations were also conducted in expanded portions of Area 1 and at several additional areas as identified in the following Work Plan documents:

- RFI Stage I Report Section 5.0 (Earth Tech and ENVIRON, July 31, 2001);
- RFI Work Plan Amendment North Parking Area / Vacant Parcel (Earth Tech, January 30, 2002);
- RFI Work Plan Amendment Main Plant Metal Plating and Recovery (Earth Tech, • August 16, 2002);
- RFI Work Plan Amendment Additional Stage II Work (Earth Tech, August 5, 2004); and
- RFI Work Plan Amendment Soil and Groundwater, Delineation (Earth Tech, • November 16, 2004.

The expanded portions of Area 1 included areas eastoomLK Boulevard (former Plant 9 and the Meadowbrook Golf Course). The new areas included the following: .de 2009 1 A.,5

- AOC 06 Electroform Room
- AOC 07 400 Plater:
- AOI 01 North Parking Area: •
- AOI 02 Chromium Recovery Area; •
- AOI 03 – Bay R4 Area;
- Area 2 309/352 Platers, Acid/Caustic Strip;
- SWMU 04 1002 Preplater; and
- SWMU 06 Nickel Recovery.

Several of the new areas were recently decommissioned metal plating and recovery areas that were, in part, the subject of the 1993 petition for review.

A Stage II data report summarizing data collected from October 2003 to February 2005 was submitted to the IDEM on March 30, 2005. That report was submitted in partial fulfillment of the corrective action requirements contained in Section F.2 of the Administrative Agreed Order Cause H-13855 between the Commissioner, Indiana Department of Environmental Management and General Motors Corporation. The data report included soil boring logs, monitoring well completion diagrams, hydrogeologic cross sections and maps, potentiometric surface maps, laboratory data reports, isoconcentration maps, and various data box plots.

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Figure 3.2 presents the locations of the various AOIs, AOCs, SWMUs, and Areas and also identifies the monitoring well, soil boring, and surface water sampling points.

#### 3.11 <u>COMPLETED INTERIM MEASURES</u>

#### 3.11.1 <u>SOUTH COURT AREA</u>

Soil was removed from the MW 31 area of AOC 1 – South Court that contained TCE concentrations that were an order of magnitude greater than the soil concentrations in other portions of the area. In addition to removing the soil in this area, perched groundwater in Unit 1 fill was treated with HRC® as a source reduction measure for TCE, cis-1,2-DCE, and VC in the underlying Unit 3 aquifer. During the interim measure, monitoring well MW 31 completed in the fill soil was removed. Following the interim measure a replacement well (MW 31R) was installed at the former MW 31 well location.

#### 3.11.2 MEADOWBROOK GOLP COURSE

Two potable wells at the Meadowbrook Golf Course were abandoned and the golf course was subsequently connected to public water supply. In addition, GM and the owners of the Meadowbrook Golf Course have entered into an access agreement that prohibits the use of groundwater under the golf course property. The agreement does allow use of surface water from a pond on the site for irrigation purposes. Samples from this pond are regularly collected and analyzed for VOCs.

#### 3.11.3 FORMER GM PRODUCTION WELLS

Five former groundwater production wells on Site were abandoned and plugged during the period April 30 to September 4, 2007 in accordance with Indiana Department of Natural Resources (IDNR) well abandonment rules (312 IAC 13). Abandonment activities including electrical disconnect, pump motor and pump column removal, and well grouting. The work followed a written work plan for well abandonment (Earth Tech, July 27, 2006) and was conducted by a licensed State of Indiana water well drilling contractor. The work is summarized in *Production Well Abandonment at MLK Boulevard Property* (Earth Tech, November 16, 2007).

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#### 4.0 SUMMARY OF HUMAN HEALTH RISK ASSESSMENT

The human health risk assessment used the site characterization data that were collected during the RFI field investigation to evaluate the potential significance of reasonable maximum exposures under current and reasonably expected future land use at and around the Site. The results of the risk assessment were used to identify where a release of hazardous waste or constituents from the Site may cause reasonable maximum exposures to be significant enough to warrant corrective measures. The significance of potential exposures was evaluated by comparing estimates of Site-related cumulative cancer and noncancer risks with a cancer risk limit of 10<sup>-4</sup> and a HI limit of 1, respectively, which U.S EPA and IDEM use as triggers for corrective measures under RCRA corrective action (U.S. EPA, 1991; IDEM RISC Guide).

The following is a summary of the findings of the human health risk assessment:

- Routine Worker risk estimates for soil and groundwater do not exceed the cumulative cancer risk limit of 10- and the HI limit of to
- Construction Worker risk estimates for soil and groundwater do not exceed the cumulative cancer risk init of 10<sup>st</sup> and the HQ init of 1;
- Recreational User risk estimates for soil and groundwater do not exceed the cumulative cancer risk limit of 10<sup>4</sup> and the HI limit of 1;
- Resident risk estimates for solid on not exceed the cumulative cancer risk limit of 10<sup>-4</sup> and the HI limit of 1. However, the cancer risk estimate associated with the "kiddie pool" non-potable use scenario at MW-4 is 2 x 10<sup>-4</sup>, while the cumulative cancer risk estimates for the remaining groundwater data do not exceed 10<sup>-4</sup>;
- Golf Course Worker risk estimates for soil, groundwater, and surface water do not exceed the cumulative cancer risk limit of 10-4 and the HI limit of 1;
- Golf Recreational User risk estimates for groundwater and surface water do not exceed the cumulative cancer risk limit of 10-4 and the HI limit of 1; and
- Trespasser risk estimates for soil and surface water do not exceed the cumulative cancer risk limit of 10<sup>-4</sup> and the HI limit of 1.

The human health risk assessment also evaluated exposures to lead. The potential exposure to lead in soil is not significant. The concentration of lead in groundwater in the industrial areas is approximately 40 times higher than the MCL, but the exposure of construction workers is approximately 10,000 times lower and therefore potential exposure in industrial areas is not significant. The lead concentration in groundwater in the non-industrial areas exceeded the MCL at three locations (MW-2, MW-5, and MW-7)

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in samples collected by HydroTech in 2003. MW-5 and MW-7 are not downgradient of the Site and therefore the lead is not believed to be Site-related. MW-2 was resampled for lead in October 2007 and no lead was detected; this is consistent with the 2005 results.

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#### 5.0 SUMMARY OF CORRECTIVE MEASURES OPTIONS

#### 5.1 <u>SITE SOIL</u>

The human health risk assessment determined that the current soil conditions do not pose a significant risk under current and reasonably expected future land use at and around the Site.

The corrective measures objective for Site soil is to limit future land use to industrial/commercial.

#### 5.1.1 <u>SUMMARY OF ALTERNATIVES</u>

The RFI conclusions are based on industrial/commercial land use. Consideration of other alternatives is therefore inappropriate.

Alternative 1: Land Use Restriction - This alternative would include a notation in the property deed(s) of the Site to funit the land use ofto industrial/commercial at the Site, consistent with the current zoning. This alternative would achieve the corrective measures objective.

#### 5.2 <u>SITE GROUNDWATER</u>

The human health risk assessment determined that the current groundwater conditions do not pose a significant risk under current and reasonably expected future land and groundwater use at and around the Site with the exception of MW-4 at the Meadowbrook Golf Course. Groundwater at the Meadowbrook Golf Course is discussed in further detail in Section 5.4.

The corrective measures objectives for groundwater are to:

- 1) confirm the continued stability of the groundwater plumes following removal of the building slab; and
- 2) prevent potable groundwater use.

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#### 5.2.1 <u>SUMMARY OF ALTERNATIVES</u>

The following Interim Measure is proposed as part of the final Corrective Measures for groundwater:

1) Production Well Abandonment – The production well abandonment discussed above in Section 3.10 addressed potential groundwater use.

The following three additional alternatives were considered:

Alternative 1: No Further Action – The no action alternative would require no activity as the selected Corrective Measure. This alternative would result in no unacceptable risks to human health under current and reasonably expected future land and groundwater use, but would not achieve the corrective measures objectives.

Alternative 2: Groundwater Monitoring - This alternative would include sampling select monitoring wells. During the monitoring period GM will continue to evaluate groundwater conditions, the required timeframe for monitoring, any changes to the monitoring program, and/or the need for any additional Corrective Measures. This alternative would achieve the first corrective measures objective.

Alternative 3: Groundwater Use Restriction – This alternative would include a notation in the property deed(s) of the Site to prohibit the use of groundwater at the Site. The City of Anderson has an ordinance, dated November 21, 2000 (Ordinance #55-2000), that prohibits the installation of new potable water wells for all areas within 300 feet of an existing and available Anderson Water Utility water supply line. The ordinance also prohibits the installation of any new well and the redrilling of any existing well in the shallow aquifer above the regional till. This alternative would achieve the second corrective measures objective.

GM proposes to implement Alternatives 2 and 3.

#### 5.3 AOC 1 - <u>SOUTH COURT</u>

The human health risk assessment determined that the current soil and groundwater conditions, following removal of soil in the vicinity of MW 31, do not pose a significant risk under current and reasonably expected future land use at and around the Site.

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Corrective measures objectives for soil and groundwater in this area will be further addressed on a site-wide basis, as discussed above in Sections 5.1 and 5.2.

#### 5.3.1 <u>SUMMARY OF ALTERNATIVES</u>

The following Interim Measure is proposed as part of the final Corrective Measures for AOC 1 – South Court:

1) Soil Removal and HRC<sup>®</sup> Treatment – The soil removal and HRC<sup>®</sup> treatment discussed above in Section 3.10 addressed the most significant TCE concentrations in soil and have decreased VOC concentrations in perched groundwater in Unit 1 fill and in the underlying Unit 3 aquifer. This Interim Measure was documented in the RFI Report.

# 5.4 <u>FORMER WWTP AREA</u>

The human health risk assessment determined that the current groundwater conditions do not pose a significant risk under current and reasonably expected future land use at and around the Site except in the vicinity of monitoring well MW-4 at the Meadowbrook Golf Course, which is downgradient of the Former WWTP Area. The primary contributor to this risk is vinyl chloride via potential non-potable groundwater use.

The corrective measures objectives for groundwater in the vicinity and downgradient of the Former WWTP Area are to:

- 1) prevent potable and non-potable groundwater use;
- 2) monitor impacts on the golf course pond, which is used for irrigation; and
- 3) reduce VOC mass in the vicinity of the Former WWTP Area.

#### 5.4.1 <u>SUMMARY OF ALTERNATIVES</u>

The following Interim Measure is proposed as part of the final Corrective Measures for the Former WWTP Area:

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1) Well Removal and Connection to Public Water – The potable well removal and connection to public water supply discussed above in Section 3.10 eliminated potable groundwater use.

The following additional alternatives were considered:

Alternative 1: No Further Action – The no action alternative would require no activity as the selected Corrective Measure. This alternative could result in unacceptable risks to human health if groundwater were used for some nonpotable purposes. However, the City of Anderson has an ordinance, dated November 21, 2000 (Ordinance #55-2000), that prohibits the installation of new potable water wells for all areas within 300 feet of an existing and available Anderson Water Utility water supply line. The ordinance also prohibits the installation of any new well and the redrilling of any existing well in the shallow aquifer above the regional till.

Alternative 2: Groundwater Use Respiction – This alternative would include a notation in the property deed(s) of the Meadowbrook Golf Course to prohibit the use of groundwater. This alternative would achieve the first corrective measures objective.

Alternative 3: Groundwater Monitoring – This alternative would include sampling select monitoring wells and surface water locations. During the monitoring period GM will continue to evaluate groundwater conditions, the required timeframe for monitoring, and/or the need for any additional Corrective Measures. This alternative would achieve the second corrective measures objective.

Alternative 4: In-Situ Bioremediation – This alternative would include injecting HRC<sup>®</sup> or a similar product in the vicinity of the Former WWTP Area, upgradient of MW-4. As observed in the South Court Area, it is anticipated that this treatment would decrease VOC concentrations of parent products (in this case cis-1,2-dichloroethene) and may temporarily increase concentrations of daughter products (vinyl chloride). During treatment, GM will monitor groundwater conditions, and evaluate the need for any changes to the treatment process. This alternative would achieve the third corrective measures objective.

Alternative 5: In-Situ Oxidation – This alternative would include injecting an oxidant in the vicinity of the former wastewater treatment plant, upgradient of MW-4. It is anticipated that this treatment would temporarily increase VOC concentrations of both parent and daughter products as material is desorbed from the soil matrix, and would then decrease VOC concentrations of both parent and daughter products. During

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treatment, GM will monitor groundwater conditions and evaluate the need for any changes to the treatment process. This alternative would achieve the third corrective measures objective.

**Alternative 6: Hydraulic Containment** – This alternative would include extracting and treating groundwater in the vicinity of the Former WWTP Area, upgradient of MW-4. During containment and treatment, GM will monitor groundwater conditions and evaluate the need for any changes to extraction network or the treatment process. This alternative would achieve the third corrective measures objective.

Based on the results achieved with in-situ bioremediation in the South Court, GM is confident that Alternative 4 would decrease VOC concentrations, following a potential for temporary increase in daughter products. In addition bioremediation typically uses non-toxic amendments, which is desirable because GM intends to sell the property east of MLK Blvd. In contrast, Alternative 5 would use strong oxidants that could potentially pose a risk during redevelopment. A temporary increase in VOC concentrations might also be associated with Alternative 5 during potential desorption of VOCs from soil. The aboveground treatment system associated with Alternative 6 would potentially limit redevelopment of the property. Therefore, GM proposes to implement Alternatives 2, 3 and 4.

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#### 6.0 EVALUATION OF PROPOSED CORRECTIVE MEASURES

Based on the findings from the RFI, the proposed final Corrective Measures are:

#### Site Soil

Alternative 2: Land Use Restriction

#### Site Groundwater

Interim Measure – Production Well Abandonment Alternative 2: Groundwater Monitoring Alternative 3: Groundwater Use Restriction

#### AOC 1 - South Court Area

Interim Measure - Soil Removal and HRC® Treatment

#### Former WWTP Area

Interim Measure – Well Removal and Connection to Public Water Alternative 2: Groundwater Use Restriction Alternative 3: Groundwater Monitoring Alternative 4: In-Situ Bioremediation

#### 6.1 <u>GENERAL REMEDY STANDARDS</u>

- 1) <u>Overall Protection</u> The risk assessment determined that current and future potential exposures to constituents in soil, groundwater, and surface water do not pose a significant risk except for groundwater exposure in the vicinity of MW-4 via potential groundwater use. Well abandonment Interim Measures including abandonment of former GM production wells, abandonment of potable wells at the Meadowbrook Golf Course, and connection of the golf course to public water supply, eliminated potentially unacceptable exposures to groundwater. A groundwater use restriction at the Meadowbrook Golf Course will prevent potential exposure to groundwater in the vicinity of MW-4. Land and groundwater use restrictions will prevent potentially unacceptable future exposures to soil and groundwater. Groundwater monitoring will confirm the stability of groundwater plume(s) following removal of the building slab. In-situ bioremediation in the Former WWTP Area will decrease the mass of VOCs and eventually decrease VOC concentrations in groundwater in the vicinity of MW-4.
- 2) <u>Attainment of media cleanup standards</u> Groundwater monitoring will confirm that concentrations remain below appropriate risk-based groundwater criteria.

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Appropriate actions will be taken in contamination is identified that poses an unacceptable risk to potential receptors. The points of compliance will be defined by the proposed monitoring wells in the groundwater monitoring plan. At the end of two full years of monitoring, GM will evaluate the results and make recommendations to continue, cease monitoring, or revise the monitoring program.

- 3) <u>Controlling the sources of releases</u> The chosen alternatives supplement the Interim Measure performed in AOC 1 South Court (see Section 3.10). In-situ bioremediation in the Former WWTP Area will address the source of groundwater impacts in the vicinity of MW-4.
- 4) <u>Compliance with applicable standards for waste management</u> All waste for the chosen alternatives will be managed in accordance with applicable standards.

## 6.2 <u>REMEDY DECISION FACTORS</u>

- 1) Long term reliability and effectiveness Land and groundwater use restrictions will be implemented in such a way that they continue with the land in the event the property, or a portion there of, is sold. In-situ bioremediation is a proven technology that has been demonstrated to be effective in AOC 1 South Court, and therefore GM is confident that this technology will also be effective in the Former WWTP Area. Groundwater monitoring will confirm the stability of groundwater plume(s).
- 2) <u>Reduction of toxicity, mobility, or volume of wastes</u> In-situ bioremediation in the Former WWTP Area will reduce VOC mass at the source of groundwater impacts in the vicinity of MW-4. Groundwater monitoring will confirm the stability of groundwater plume(s).
- 3) <u>Short-term effectiveness</u> The vinyl chloride concentration in the vicinity of MW-4 may increase temporarily as a result of bioremediation. GM will monitor groundwater conditions during treatment, and evaluate the need for any changes to the treatment process.
- 4) <u>Implementation</u> The selected remedy alternatives can be implemented with minimal engineering and administrative procedures and with no impact to the surrounding community with the exception of continued off-Site groundwater sampling. The field work and reporting associated with the groundwater monitoring program are routine activities that can easily be implemented. Potential contingency measures associated with the groundwater monitoring program could also be easily implemented if necessary. It is anticipated that

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bioremediation would require Geoprobe injection and/or well installation in the Former WWTP Area. GM is planning to sell Lot 1, which includes all GM property east of MLK Blvd, but will reserve access rights if this property is transferred.

5) Costs – Costs associated with the groundwater monitoring program are minimal unless contingent activities are necessary. Costs associated with land and groundwater use restrictions would also be minimal. The most significant cost would be associated with bioremediation in the Former WWTP Area. The groundwater conditions in this area must be further evaluated to calculate the volume of HRC<sup>©</sup> (or other amendment) necessary, but based on previous experience it is anticipated that the cost may be on the order of \$50,000 to \$100,000 per injection, and that at least two injections would be required. It is anticipated that the cost for in-situ oxidation would be somewhat higher due to the greater frequency of injection, and the dot for hydraulic containment could be substantially higher due to the potential feed for treatment of the extracted However, as previously discussed, GM is confident that groundwater. bioremediation will be effective based on previous use of this technology in AOC 1 - South Court, and bioremediation is most consistent with the anticipated future transfer of the property.

Based on information currently available, the proposed remedy for the Site provides the best balance of Corrective Measures scenarios with respect to the evaluation criteria.

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